

Gardnerella vaginalis as a Rare Cause of Prosthetic Joint Infection

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We describe a septic loosening of a hip prosthesis in a 71-year-old woman caused by *Gardnerella vaginalis*. Infection was confirmed by culture and molecular identification of this bacterium. The patient was treated by a one-step exchange of prosthesis and antibiotic therapy combining trimethoprim-sulfamethoxazole and rifampin, with favorable evolution.

CASE REPORT

A 71-year-old woman was hospitalized in the infectious diseases unit of Grenoble University Hospital for prolonged fever, altered general status, and pain of the right hip with cruralgia for 3 months. Her medical history included tuberculosis, diphtheria, hepatitis A, and dyslipidemia for which she received rosuvastatin. The patient had undergone replacement surgery of both hips 10 years earlier. A septic loosening of the right hip prosthesis was evoked.

On admission, the patient was subfebrile at 38°C. Pain of the right hip and cruralgia were not relieved by analgesic treatment, including morphine and nonsteroidal anti-inflammatory drugs (visual analogue score, 6/10). A limitation of hip joint mobility was noted. Walking was possible but with a limp. There were no motor or sensory deficits, and tendon reflexes were normal and symmetrical. The rest of the physical examination was unremarkable. There were no clinical signs suggestive of localized infection, especially no signs of pulmonary or urinary tract infection.

Laboratory tests showed anemia (hemoglobin, 11 g/dl) and inflammation (C-reactive protein, 70 mg/liter; ferritinemia, 489 µg/liter; increased production of alpha 1 and 2 globulins on serum protein electrophoresis but immunoglobulins within normal limits). The leukocyte count was 5.2×10^9 cells/liter. Cultures of blood and urine samples were negative. A chest radiograph was normal. A computed tomography (CT) scan (chest-abdomen-pelvis) was performed and did not show any cancer or abscess. No fluid effusion was found around the right hip prosthesis by ultrasonography, and hip radiographs were normal. However, fluorine-18 fluorodeoxyglucose (FDG) scintigraphy revealed intense uptake around the hip prosthesis that was highly suggestive of a septic process.

Debridement and one-step surgical replacement of the right hip prosthesis were performed. During the intervention, the surgeon noticed a turbid synovial fluid and confirmed the loosening of the femoral component of the hip prosthesis. A new prosthesis was reimplanted, the process corresponding to uncemented total hip arthroplasty with a dual-mobility acetabular cup. Fifteen clinical specimens were sampled during the intervention for microbiological analysis: the femoral cortex (1 specimen), the femoral centromedullary channel (4 specimens), the articular fluid (1 specimen), synovial biopsy specimens (5 specimens), and the acetabulum (4 specimens). Direct examination of Gram-stained smears prepared from clinical samples was negative in all cases. The 15 specimens were inoc-

ulated onto blood agar plates, including Columbia-5% sheep blood agar plates (bioMérieux, Marcy l'Etoile, France) and chocolate-Polyvitex agar plates (bioMérieux), and incubated at 37°C under a 5% CO₂ atmosphere for 7 days. They were also inoculated into Schaedler broth medium (bioMérieux) incubated 14 days at 37°C for cultivation of fastidious bacteria, especially anaerobes. Bacterial growth in the Schaedler broth medium was evaluated by Gram staining, and positive broths were subcultured on blood agar plates incubated at 37°C, either under a 5% CO₂ atmosphere or in an anaerobic atmosphere. A Gram-positive coryneform bacterium was grown from all clinical specimens. Because identification of *Corynebacterium* spp. is often unreliable using conventional techniques, we directly performed 16S rRNA gene amplification and sequencing, using primers fD1 (5'-AGAGTTTGATCCTGGCTCAG-3') and rP2 (5'-ACGGCTACCTTGTTACGACTT-3'). A definite identification of *Gardnerella vaginalis* was obtained within 1 week, with 100% identity of the 1,187-bp amplified sequence (GenBank accession no. [JX391978](#)) with that of a type strain of *G. vaginalis* (ATCC 14019, GenBank accession number [CP002104.1](#)) using BLAST software (NCBI, Bethesda, MD).

There is currently no standardized protocol for *G. vaginalis* antimicrobial susceptibility testing. Thus, we used an agar disk diffusion method, previously described for coryneform bacteria (9) (Mueller-Hinton plate, supplemented with 5% sheep blood, bioMérieux, Lyon, France), and breakpoints advocated by the CLSI (Clinical and Laboratory Standards Institute) for *Streptococcus* spp. (4) The isolated strain was susceptible to penicillin G, amoxicillin, cephalothin, cefotaxime, imipenem, gentamicin, chloramphenicol, doxycycline, erythromycin, pristinamycin, rifampin, trimethoprim (TMP)-sulfamethoxazole (SMX), and vancomycin but was resistant to ofloxacin.

The patient first received intravenous piperacillin (4 g/day)-tazobactam (500 mg/day) plus vancomycin (2 g/day) therapy for 10 days. When bacterial identification was available, the treatment was changed to trimethoprim-sulfamethoxazole (TMP, 320 mg/day; SMX, 1,600 mg/day) and rifampin (1,200 mg/day) for 3 months of oral therapy. The patient had no clin-

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TABLE 1 Cases of osteoarticular infections caused by *Gardnerella vaginalis* reported in the literature

Yr of presentation	Age (yr)	Gender ^a	Lesion	Reference
1986	Neonate	M	Osteomyelitis of parietal bone	Nightingale (11)
1995	50	F	Vertebral disk space infection	Hodge (6)
2004	48	F	Hip arthritis	Sivadon-Tardy (14)
2008	38	F	Discitis	Graham (5)
2012	71	F	Hip prosthesis infection	Present report

^a M, male; F, female.

ical signs of genital infection. *G. vaginalis* was not isolated from vaginal and urine specimens. We did not look for other carriage sites. Following prosthetic replacement, the evolution has been satisfactory for the 6-month follow-up, with disappearance of fever, pain in the hip, and cruralgia and normalization of the C-reactive protein level.

G. vaginalis is a facultative anaerobic bacterium that occasionally colonizes the vaginal mucosa in women (3). It has also been detected in the microflora of other mucosa, especially of the oral cavity (15). It is mainly associated with bacterial vaginosis (3). Rarely, *G. vaginalis* has been associated with bacteremia, especially in the context of postpartum (12) and gynecological (3, 12) infections, and neonatal infections (3). Bloodstream infections in men, more rare, have been also described (3, 7). Reports on *G. vaginalis* osteoarticular infections are exceptional and, not surprisingly, occurred in women or neonates. Two nosological forms have been described: the first one is associated with a reactive arthritis (13), and it is characterized by a negative culture of joint fluid; the second one corresponds to a true osteoarticular infection as demonstrated by the ability to isolate *G. vaginalis* from clinical samples (especially joint fluid). Only a few cases of *G. vaginalis*-related septic osteoarticular infections have been reported in the literature (Table 1), including one case of osteomyelitis of the parietal bone in a neonate (11), two cases of discitis in women (5, 6), and one case of hip arthritis in a woman (14). In all these cases, no genital infection could be demonstrated.

G. vaginalis infection of the prosthetic hip in our patient cannot be questioned because the bacterium was isolated from all 15 clinical samples collected during surgery. No other microorganism was isolated from the same specimens. The pathogenic implication of *G. vaginalis* in the septic loosening of the hip is highly likely, according to the OSIRIS (Oxford Skeletal Infection Research and Intervention Service) collaborative study group criteria (1). This infection occurred 10 years after the first surgical replacement and thus is a delayed complication of the initial arthroplasty. As is often the case in very late infections, the clinical presentation was insidious, with progressive worsening of joint pain and without evidence of severe sepsis (10). Infection of the hip prosthesis probably occurred after transient hematogenous spread of *G. vaginalis*, which probably explains the fact that blood cultures were sterile at the time of hospitalization. It should be mentioned, however, that *G. vaginalis* growth is partially inhibited by sodium polyanethol sulfonate (SPS), an anticoagulant present in blood culture bottles. The patient had no predisposing factors for infections, such as immunosuppression (no HIV infection, no

corticosteroid intake), diabetes mellitus, renal failure, obesity, or alcohol or tobacco consumption. Previous hip arthroplasty was the only risk factor *per se* for prosthetic joint infection (10). Dental care was performed 1 month before the onset of infection and could potentially lead to *G. vaginalis* bacteremia, since this bacterium has been previously detected in the oral cavity (15), but this possibility remains to be established. Berbari et al. (2) previously reported that dental procedures were not associated with an increased risk of prosthetic hip infection, and antibiotic prophylaxis in patients with hip arthroplasty and undergoing dental treatment did not decrease the risk of septic loosening (2).

The formation of a bacterial biofilm around the prosthesis is strongly associated with a septic loosening outcome (16). With the experience of bacterial vaginosis, we know that *G. vaginalis* can form a dense biofilm and possesses adhesion factors (3). Interestingly, Marrazzo et al. (8) recently demonstrated that bacterial vaginosis could be acquired from extravaginal reservoirs. These data suggest the ability of *G. vaginalis* to colonize surfaces outside its vaginal ecological niche.

Our case is the first report of *G. vaginalis* prosthesis joint infection. It emphasizes that *G. vaginalis* may cause extravaginal infections, especially osteoarticular infections in patients with or without joint prosthesis. It is important for microbiologists and physicians to be aware of this possibility, since *G. vaginalis* is a fastidious and difficult-to-identify microorganism.

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